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September 25, 2002

Ms. Kristy Chew
Siting Project Manager
California Energy Commission
1516 Ninth Street, MS-15
Sacramento, CA 95814

RE: Data Responses, Set 4B
Cosumnes Power Plant (01-AFC-19)

On behalf of the Sacramento Municipal Utility District, please find attached 12 copies and one original of the Data Responses, Set 4 B, in response to Staff's Data Requests dated May 10, 2002. This is a revised study of transmission system impacts.

Please call me if you have any questions.

Sincerely,

CH2M HILL

John L. Carrier, J.D.
Program Manager

c: Colin Taylor/SMUD
Kevin Hudson/SMUD
Steve Cohn/SMUD

COSUMNES POWER PLANT (01-AFC-19)

DATA RESPONSE, SET 4B

(Response to Data Request 254, Supplemental)

Submitted by

SACRAMENTO MUNICIPAL UTILITY DISTRICT (SMUD)

September 25, 2002

2485 Natomas Park Drive, Suite 600
Sacramento, California 95833-2937

Technical Area: Transmission System Engineering

Authors: Henry Zaininger and Laiping Ng
CPP Author: Gil Butler

BACKGROUND

Staff needs additional documentation and information regarding the System Impact Study and proposed mitigation measures in order to prepare the Staff Assessment for the Cosumnes Power Plant. For the studies requested herein, please use the Roseville Energy Facility (01-AFC-14) November 12, 2002 System Impact Study docketed January 2002.

Please note that staff is advised that the termination configuration of the Roseville Energy Facility project may change (Roseville Energy Facility Data Responses 157-192, dated March 15, 2002). While uncertain at this time it may be necessary to revise the studies requested herein if the Roseville termination configuration changes.

DATA REQUEST

254. Please provide stability studies for the transmission facilities with and without the project for both peak and off-peak (light spring) seasons.

Response: Please see attached CPP Transmission System Impact 500 kV Sensitivity Study (Attachment TSE-254B).

Attachment TSE-254B

Cosumnes Power Plant
Transmission System Impact
500 kV Sensitivity Study

By:
Sacramento Municipal Utility District

September 25, 2002

Study Purpose

This study evaluates the potential cumulative impacts on the existing transmission system attributable to the proposed 1000 MW Cosumnes Power Plant (CPP) during selected 500 kV transmission line outages.

Summary

The following 500 kV outages were simulated using both the summer case and the spring case:

- Table Mountain to Tesla 500 kV single line outage
- Vaca-Dixon to Tesla 500 kV single line outage
- Table Mountain to Tesla and Table Mountain to Vaca-Dixon 500 kV double line outage

No overloads attributable to the CPP were identified on the 2,400 lines and transformers (60 kV through 500 kV) in the Northern California area.

Study Description

The power flow base cases used are those with which the previous CPP transmission system impact studies were performed, but are limited to those that do not include the Roseville Energy Facility or the Rio Linda/Elverta generation project. The power flow base case descriptions, as included in the original CPP transmission impact study, are provided as Appendix A.

The Operating Transfer Capability Policy Group (OTCPG) of the Western Electricity Coordinating Council (WECC) is responsible for establishing both transfer schedule limits and remedial action schemes to safeguard the 500 kV transmission systems within the western region of the United States and Canada. Various remedial action schemes are established for the different potential 500 kV outages to return line and transformer power flows to acceptable levels during system disturbances. Nomograms describing transfer limits, such as maximum exports from the Pacific Northwest to California, are imposed to avoid operating conditions for which the remedial action schemes are not adequate. The remedial action schemes and transfer limits are based on extensive system studies performed each year for the upcoming seasons, and can be influenced by factors such as Northern California generation levels.

For the purposes of this study, existing remedial action schemes for the included outages were used as guidelines to evaluate the relative impacts of the CPP.

The following tables include all lines and transformers 60 kV through 500 kV within Northern California that were identified as having flows at 90% or greater of emergency ratings (appropriate during outage conditions), both with and without the 1000 MW CPP generation. Each table describes flows during a specific outage, and lists the flows without CPP, with CPP, and the differences. The tables indicate flows both as MVA and percentages of emergency ratings, and are sorted by percent rated loading with CPP generation. Elements with highest loadings with CPP generation are at beginnings of each table. Overloaded elements and their percent loadings are shown in bold print.

Summer, Table Mountain to Tesla 500 kV Single Line Out

During heavy summer conditions with an outage of the Table Mountain to Tesla 500 kV line, three PG&E lines are identified as having slight overloads without the CPP. With CPP added, the overload on the 230 kV line is eliminated, the overload on the 115 kV line is reduced slightly, and the overload on the 60 kV line is not affected.

For an outage of the Table Mountain to Tesla 500 kV line, no remedial action scheme was employed.

Table HS.1

From Bus		To Bus		Ckt	No Cosumnes		With Cosumnes		Change	
Name	kV	Name	kV	ID	MVA	% Rate	MVA	% Rate	MVA	%Rate
LAKEWD-C	**115**	**LKWD_JCT**	**115**	1	196.9	**103.8**	195.2	**102.8**	-1.7	-1.0
WESCOT2	**60**	**WADHMJCT**	**60**	1	35.4	**102.2**	35.4	**102.0**	0.0	-0.2
POCKET	230	POCKET 2	69	2	223.6	99.8	223.3	99.7	-0.3	-0.1
PANOCHE	**230**	**PNCHE 2M**	**230**	2	121.9	**100.1**	121.0	99.4	-0.9	-0.7
PNCHE 2M	230	PANOCHE	115	2	121.1	99.4	120.1	98.6	-1.0	-0.8
BRIGHTON	230	BRGHTN M	230	1	134.3	93.3	140.3	97.5	6.0	4.2
LOCKFORD	230	LOCKEFRD	60	1	154.9	96.0	155.8	96.6	0.9	0.6
WARNERVL	230	WRNRVLLE	115	3	63.1	84.1	71.4	95.3	8.3	11.2
WARNERVL	230	WRNRVLLE	115	2	63.1	84.1	71.4	95.3	8.3	11.2
WARNERVL	230	WRNRVLLE	115	1	126.1	84.1	142.9	95.3	16.8	11.2
ELVRTAX1	230	ELVERTA1	69	1	104.4	94.1	104.5	94.2	0.1	0.1
ELVRTAX2	230	ELVERTA2	69	1	104.4	94.1	104.4	94.0	0.0	-0.1
DRUM	60	BONNIE N	60	1	33.0	95.7	32.6	93.7	-0.4	-2.0
ATLANTC	230	ATLANTIC	60	1	150.4	93.2	150.2	93.1	-0.2	-0.1
CARMICAL	230	CARMICAL	69	1	208.1	92.9	207.9	92.8	-0.2	-0.1
CLAYTN	115	LKWD_JCT	115	1	223.7	93.2	222.3	92.5	-1.4	-0.7
KESWICK	230	SPRINGCR	230	2	186.6	92.6	185.6	91.7	-1.0	-0.9
HURLEY S	230	HURLEY 2	69	2	205.3	91.6	204.9	91.5	-0.4	-0.1
MOSHERJT	60	MSHR 60V	60	1	38.8	92.5	38.8	91.3	0.0	-1.2
BA FOOD1	60	BA FOOD2	60	1	110.2	91.7	110.1	91.2	-0.1	-0.5
MONTAVIS	230	MNTA VSA	60	1	145.7	90.3	145.6	90.3	-0.1	0.0
HEDGE	230	HEDGE 3	69	3	200.2	90.2	200.3	90.2	0.1	0.0
HEDGE	230	HEDGE 1	69	1	201.9	90.1	201.8	90.1	-0.1	0.0
CAPEHORN	60	BONNIE N	60	1	30.5	91.8	30.3	89.9	-0.2	-1.9
TBL MT D	230	RIO OSO	230	1	380.1	99.1	337.0	87.1	-43.1	-12.0
PALRMO M	230	PALERMO	230	1	153.6	93.2	141.6	85.9	-12.0	-7.3
PALERMO	115	E.MRY J2	115	1	71.8	92.3	66.8	85.1	-5.0	-7.2
E.NICOLS	115	E.MRY J2	115	1	67.1	92.2	62.9	84.9	-4.2	-7.3
E.NICOLS	115	RIO OSO	115	1	67.4	92.3	62.6	84.2	-4.8	-8.1

Summer, Vaca-Dixon to Tesla 500 kV Single Line Out

During heavy summer conditions with an outage of the Vaca-Dixon to Tesla 500 kV line, the same three PG&E lines are identified as having slight overloads without the CPP. With CPP added, the overload on the 230 kV line is eliminated, the overload on the 115 kV line is reduced slightly, and the overload on the 60 kV line is not affected.

For an outage of the Vaca-Dixon to Tesla 500 kV line, the remedial action scheme was limited to bypassing the Table Mountain to Vaca-Dixon 500 kV line series capacitors at one end.

Table HS.2

From Bus		To Bus		Ckt	No Cosumnes		With Cosumnes		Change	
Name	kV	Name	kV	ID	MVA	% Rate	MVA	% Rate	MVA	%Rate
LAKEWD-C	**115**	**LKWD_JCT**	**115**	1	196.8	**103.8**	195.1	**102.8**	-1.7	-1.0
WESCOT2	**60**	**WADHMJCT**	**60**	1	35.4	**102.4**	35.4	**102.2**	0.0	-0.2
PANOCHE	**230**	**PNCHE 2M**	**230**	2	122.3	**100.4**	121.7	99.9	-0.6	-0.5
POCKET	230	POCKET 2	69	2	223.5	99.8	223.3	99.7	-0.2	-0.1
PNCHE 2M	230	PANOCHE	115	2	121.4	99.7	120.7	99.1	-0.7	-0.6
BRIGHTON	230	BRGHTN M	230	1	135.5	94.1	141.0	97.9	5.5	3.8
LOCKFORD	230	LOCKEFRD	60	1	154.8	95.9	156.2	96.9	1.4	1.0
DRUM	60	BONNIE N	60	1	32.6	94.4	33.3	95.3	0.7	0.9
WARNERVL	230	WRNRVLLE	115	2	62.6	83.4	70.8	94.4	8.2	11.0
WARNERVL	230	WRNRVLLE	115	3	62.6	83.4	70.8	94.4	8.2	11.0
WARNERVL	230	WRNRVLLE	115	1	125.1	83.4	141.6	94.4	16.5	11.0
ELVRTAX1	230	ELVERTA1	69	1	104.4	94.1	104.5	94.2	0.1	0.1
ELVRTAX2	230	ELVERTA2	69	1	104.5	94.1	104.4	94.0	-0.1	-0.1
ATLANTC	230	ATLANTIC	60	1	150.3	93.2	150.1	93.1	-0.2	-0.1
CARMICAL	230	CARMICAL	69	1	208.0	92.9	207.9	92.8	-0.1	-0.1
CLAYTN	115	LKWD_JCT	115	1	223.6	93.2	222.2	92.5	-1.4	-0.7
CAPEHORN	60	BONNIE N	60	1	30.2	90.5	30.9	91.5	0.7	1.0
HURLEY S	230	HURLEY 2	69	2	205.2	91.6	204.9	91.5	-0.3	-0.1
KESWICK	230	SPRINGCR	230	2	186.3	92.4	185.3	91.4	-1.0	-1.0
BA FOOD1	60	BA FOOD2	60	1	110.2	91.5	110.0	91.0	-0.2	-0.5
MOSHERJT	60	MSHR 60V	60	1	38.8	91.9	38.8	90.5	0.0	-1.4
HEDGE	230	HEDGE 3	69	3	200.2	90.2	200.3	90.2	0.1	0.0
MONTAVIS	230	MNTA VSA	60	1	145.7	90.3	145.5	90.2	-0.2	-0.1
HEDGE	230	HEDGE 1	69	1	201.9	90.1	201.7	90.1	-0.2	0.0
TBL MT D	230	RIO OSO	230	1	364.0	95.0	318.6	82.4	-45.4	-12.6
PALRMO M	230	PALERMO	230	1	149.2	90.4	135.9	82.3	-13.3	-8.1
PALERMO	115	E.MRY J2	115	1	70.0	90.0	64.4	82.0	-5.6	-8.0

Summer, Table Mountain to Tesla and Table Mountain to Vaca-Dixon 500 kV Double Line Outage

During heavy summer conditions with an outage of both the Table Mountain to Tesla and Table Mountain to Vaca-Dixon 500 kV lines, two PG&E lines and two SMUD transformers are identified as having slight overloads without the CPP. With CPP added, the overloads on the PG&E lines are reduced slightly and the overloads on the SMUD transformers are eliminated.

For this 500 kV double line outage, the remedial action scheme included dropping 2,000 MW of Pacific Northwest generation at Chief Joseph and Grand Coulee; dropping Feather River generation at Hyatt, Thermalito and Caribou; dropping pump loads at Delta, Buenavista, Windgap, Wheeler and Dos Amigo; and compensating for the loss of Pacific Northwest exports by increasing PG&E generation principally at Moss Landing, Contra Costa, Helms, and Melones, and reducing exports to Southern California.

Table HS.3

From Bus		To Bus		Ckt	No Cosumnes		With Cosumnes		Change	
Name	kV	Name	kV	ID	MVA	% Rate	MVA	% Rate	MVA	%Rate
LAKEWD-C	**115**	**LKWD_JCT**	**115**	1	199.5	**104.9**	196.3	**102.8**	-3.2	-2.1
WESCOT2	**60**	**WADHMJCT**	**60**	1	35.4	**101.3**	35.4	**101.0**	0.0	-0.3
POCKET	230	POCKET 2	69	2	223.5	99.8	223.2	99.6	-0.3	-0.2
BRIGHTON	230	BRGHTN M	230	1	122.1	84.8	143.0	99.3	20.9	14.5
WARNERVL	230	WRNRVLLE	115	2	69.9	93.2	74.0	98.7	4.1	5.5
WARNERVL	230	WRNRVLLE	115	3	69.9	93.2	74.0	98.7	4.1	5.5
WARNERVL	230	WRNRVLLE	115	1	139.8	93.2	148.0	98.7	8.2	5.5
LOCKFORD	230	LOCKEFRD	60	1	154.5	95.8	158.4	98.2	3.9	2.4
RIO OSO	115	RO OSOTB	115	1	101.4	85.7	118.5	96.6	17.1	10.9
ELVRTAX1	**230**	**ELVERTA1**	**69**	1	114.8	**103.4**	104.6	94.2	-10.2	-9.2
ELVRTAX2	**230**	**ELVERTA2**	**69**	1	124.0	**112.0**	104.4	94.0	-19.6	-18.0
ATLANTC	230	ATLANTIC	60	1	150.1	93.0	149.6	92.7	-0.5	-0.3
CARMICAL	230	CARMICAL	69	1	207.9	92.8	207.7	92.7	-0.2	-0.1
CLAYTN	115	LKWD_JCT	115	1	225.6	93.8	222.9	92.3	-2.7	-1.5
BA FOOD1	60	BA FOOD2	60	1	111.2	92.6	111.0	92.0	-0.2	-0.6
HURLEY S	230	HURLEY 2	69	2	205.1	91.6	204.7	91.4	-0.4	-0.2
PANOCHE	230	PNCHE 2M	230	2	107.0	87.8	110.6	90.8	3.6	3.0
HEDGE	230	HEDGE 3	69	3	200.3	90.2	200.3	90.2	0.0	0.0
MONTAVIS	230	MNTA VSA	60	1	145.7	90.3	145.3	90.1	-0.4	-0.2
HEDGE	230	HEDGE 1	69	1	201.8	90.1	201.6	90.0	-0.2	-0.1
KESWICK	230	SPRINGCR	230	2	184.5	91.0	183.4	89.0	-1.1	-2.0
MIDLFORK	230	MDDLFK M	230	1	141.2	90.0	139.2	88.2	-2.0	-1.8
MOSHERJT	60	MSHR 60V	60	1	38.8	91.1	38.8	87.9	0.0	-3.2
DRUM	60	BONNIE N	60	1	33.7	97.0	30.5	86.3	-3.2	-10.7
CAPEHORN	60	BONNIE N	60	1	31.2	93.1	28.3	82.6	-2.9	-10.5
MELONES	230	COTTLE A	230	J1	277.5	91.3	219.1	71.1	-58.4	-20.2
PALRMO M	230	PALERMO	230	1	159.9	97.6	98.5	60.3	-61.4	-37.3
PALRMO M	230	PALERMO	115	1	159.2	95.0	98.9	59.1	-60.3	-35.9
TBL MT D	230	TBL MT E	230	1	869.5	94.8	412.2	44.5	-457.3	-50.3

Spring, Table Mountain to Tesla 500 kV Single Line Out

During spring conditions with an outage of the Table Mountain to Tesla 500 kV line, the Table Mountain to Vaca-Dixon and Vaca-Dixon to Tesla 500 kV lines are overloaded without the CPP. With CPP added, the overloads on both of these lines are reduced slightly.

For an outage of the Table Mountain to Tesla 500 kV line, no remedial action scheme was employed. The overloads on the Table Mountain to Vaca-Dixon and Vaca-Dixon to Tesla 500 kV lines would be substantially reduced or eliminated with the bypassing of series capacitors on the Table Mountain to Vaca-Dixon 500 kV lines.

Table SP.1

From Bus		To Bus		Ckt	No Cosumnes		With Cosumnes		Change	
Name	kV	Name	kV	ID	MVA	% Rate	MVA	% Rate	MVA	%Rate
TABLE MT	**500**	**VACA-DIX**	**500**	1	3141.3	**132.4**	3122.1	**131.9**	-19.2	-0.5
VACA-DIX	**500**	**TESLA**	**500**	1	2541.1	**107.9**	2471.4	**105.4**	-69.7	-2.5
BELLOTA	230	COTTLE B	230	1	176.8	58.0	284.4	94.6	107.6	36.6
WARNERVL	230	COTTLE B	230	1	170.4	56.0	277.8	92.5	107.4	36.5

Spring, Vaca-Dixon to Tesla 500 kV Single Line Out

During spring conditions with an outage of the Vaca-Dixon to Tesla 500 kV line, the Table Mountain to Tesla 500 kV line is identified as having a very slight overload without the CPP. With CPP added, this overload is eliminated.

For an outage of the Vaca-Dixon to Tesla 500 kV line, the remedial action scheme was limited to bypassing the Table Mountain to Vaca-Dixon 500 kV line series capacitors at one end.

Table SP.2

From Bus		To Bus		Ckt	No Cosumnes		With Cosumnes		Change	
Name	kV	Name	kV	ID	MVA	% Rate	MVA	% Rate	MVA	%Rate
TABLE MT	**500**	**TESLA**	**500**	1	2399.7	**100.7**	2360.9	99.1	-38.8	-1.6
BELLOTA	230	COTTLE B	230	1	187.4	61.8	283.8	94.2	96.4	32.4
WARNERVL	230	COTTLE B	230	1	181.3	59.7	277.2	92.1	95.9	32.4
CROCKETT	230	SOBRANTE	230	1	374.7	93.9	347.3	87.0	-27.4	-6.9

Spring, Table Mountain to Tesla and Table Mountain to Vaca-Dixon 500 kV Double Line Outage

During spring conditions with an outage of both the Table Mountain to Tesla and Table Mountain to Vaca-Dixon 500 kV lines, no overloads were identified either without or with CPP

For this 500 kV double line outage, the remedial action scheme included dropping 2,000 MW of Pacific Northwest generation at Chief Joseph and Grand Coulee; dropping Feather River generation at Hyatt, Thermalito and Caribou; dropping pump loads at Delta, Buenavista,

Windgap, Wheeler and Dos Amigo; and compensating for the loss of Pacific Northwest exports by increasing PG&E generation principally at Moss Landing, Contra Costa, Helms, and Melones, and reducing exports to Southern California.

Table SP.3

From Bus		To Bus		Ckt	No Cosumnes		With Cosumnes		Change	
Name	kV	Name	kV	ID	MVA	% Rate	MVA	% Rate	MVA	%Rate
WLLW SLJ	60	KNGHTSLJ	60	1	18.8	91.7	20.1	98.4	1.3	6.7
PANOCHE	230	PNCHE 2M	230	2	116.7	95.8	116.5	95.6	-0.2	-0.2
STNDFDM1	115	STANDFRD	70	1	33.7	84.4	38.2	95.5	4.5	11.1
MAXWELL	500	TRACY	500	1	2607.7	94.7	2609.9	95.1	2.2	0.4
OLINDA	500	MAXWELL	500	1	2652.0	94.7	2652.0	95.1	0.0	0.4
PNCHE 2M	230	PANOCHE	115	2	112.7	92.6	112.4	92.4	-0.3	-0.2

Appendix A
Description of Power Flow Data
From Original CPP System Impact Study

Power flow analysis was performed using data initially developed by the Pacific Gas and Electric Company (PG&E) and Southern California Edison Company (SCE) provided to the California Independent System Operator (CAISO) for transmission assessment studies. The data was further reviewed and refined by members of the Sacramento Area Transmission Planning Group (SATPG) while being prepared by Western Area Power Administration (Western) for a recently completed interconnection study. That interconnection study was for the proposed Florida Power and Light Energy (FPLE) 560 MW generation plant near the Western/SMUD Elverta Substation in the north-west portion of the SMUD service area.

The cases selected for this Cosumnes Power Plant generation impact study are the 2005 Heavy Summer and 2004 Spring cases, each with the FPLE 560 MW plant in service and without the FPLE generation project.

These cases were developed to investigate future system needs and include foreseeable generation projects but do not include all associated transmission upgrades. Since the base cases do include some element thermal overloads and mitigation of those overloads is outside the scope of this study, only relative, or incremental impacts are addressed here.

The summer case reflects peak load conditions with maximum (4800 MW) import into California from the Pacific Northwest. Transfers from the PG&E area to Southern California were adjusted to accommodate the additional generation at Elverta. To compensate for the addition of generation at the Cosumnes Power Plant, Generation was reduced at PG&E's Diablo Canyon, Helms, Moss Landing, Pittsburg, Contra Costa and Morro Bay plants. For comparisons, power transfers from PG&E to Southern California were adjusted in place of reducing PG&E generation, and the results showed no significant differences for the purposes of this study.

The spring case is an extreme test of worst-case impacts of additional generation in the Sacramento area. While the PG&E area load is only 60% of the summer load, the average PG&E generation outside the Sacramento area is only 50% of the capacity reflected in the summer case while the Sutter Power Plant is at more than 97% (510 MW), the FPLE project at Elverta is at 100 % (560 MW), the Cosumnes Power Plant is at 100% (1000 MW), and the remainder of the Sacramento area generation is at 80%. Additional stress is incorporated by the heavy import schedule into California from the Pacific Northwest (4500 MW) combined with the 3600 MW maximum export from PG&E to Southern California. The result is an extreme imbalance of heavy generation in the Sacramento area combined with an extreme north to south flow through the PG&E area from the Pacific Northwest to Southern California. PG&E generation outside the Sacramento area was proportionately scaled in the power flow cases to compensate for additions of new generation in the Sacramento area while maintaining both the heavy imports from the Northwest and heavy exports to Southern California.